Energy Technologies Area Lawrence Berkeley National Laboratory

Improving Commercial Building Energy Efficiency in China- Learning from the U.S. experiences

完善中国的商业建筑节能- 从美国学习经验

Nan Zhou, Staff Scientist and Deputy Group Leader

China Energy Group, LBNL

周楠,

劳伦斯伯克利国家实验室科学家，中国能源组副主任

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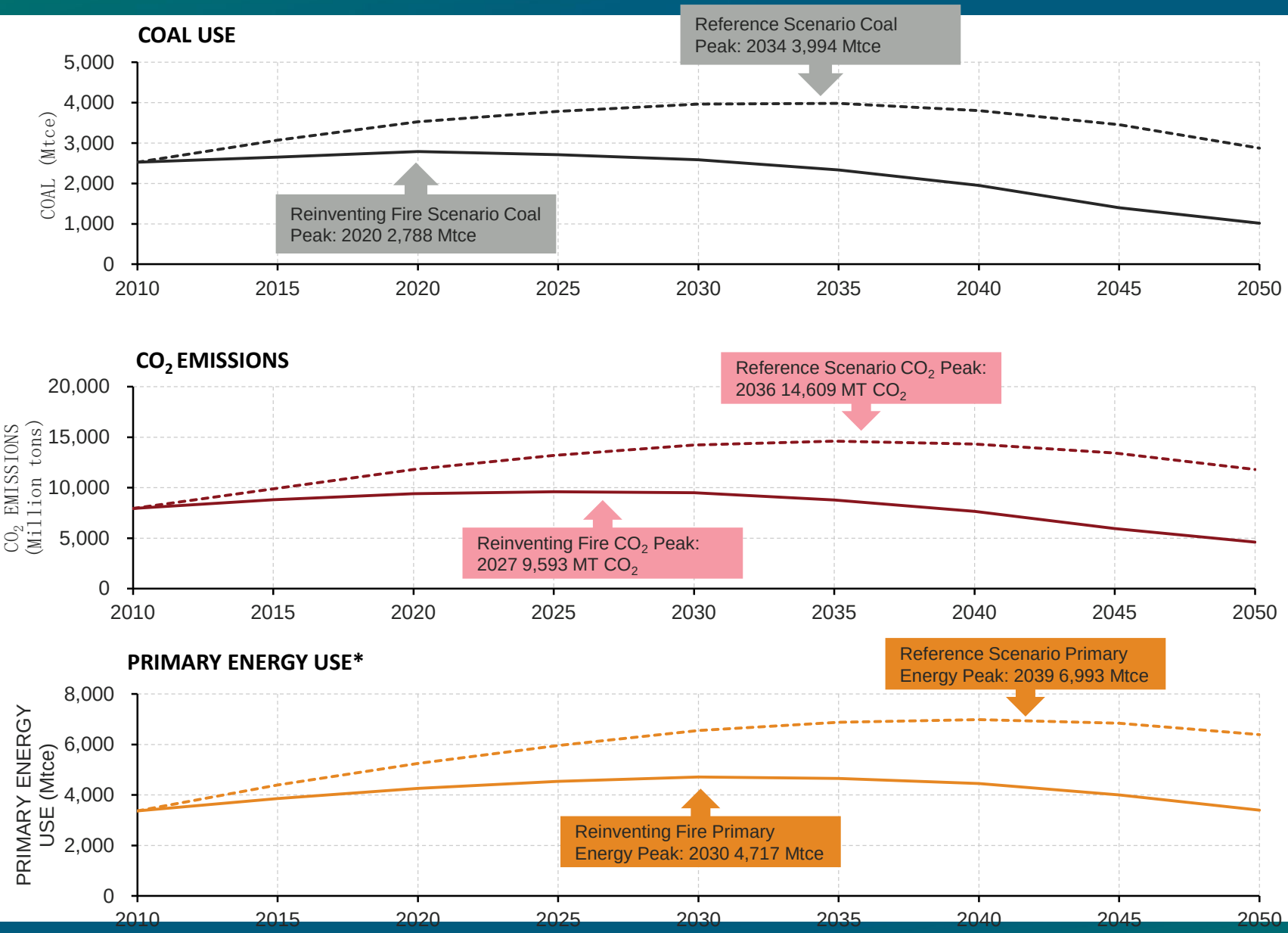
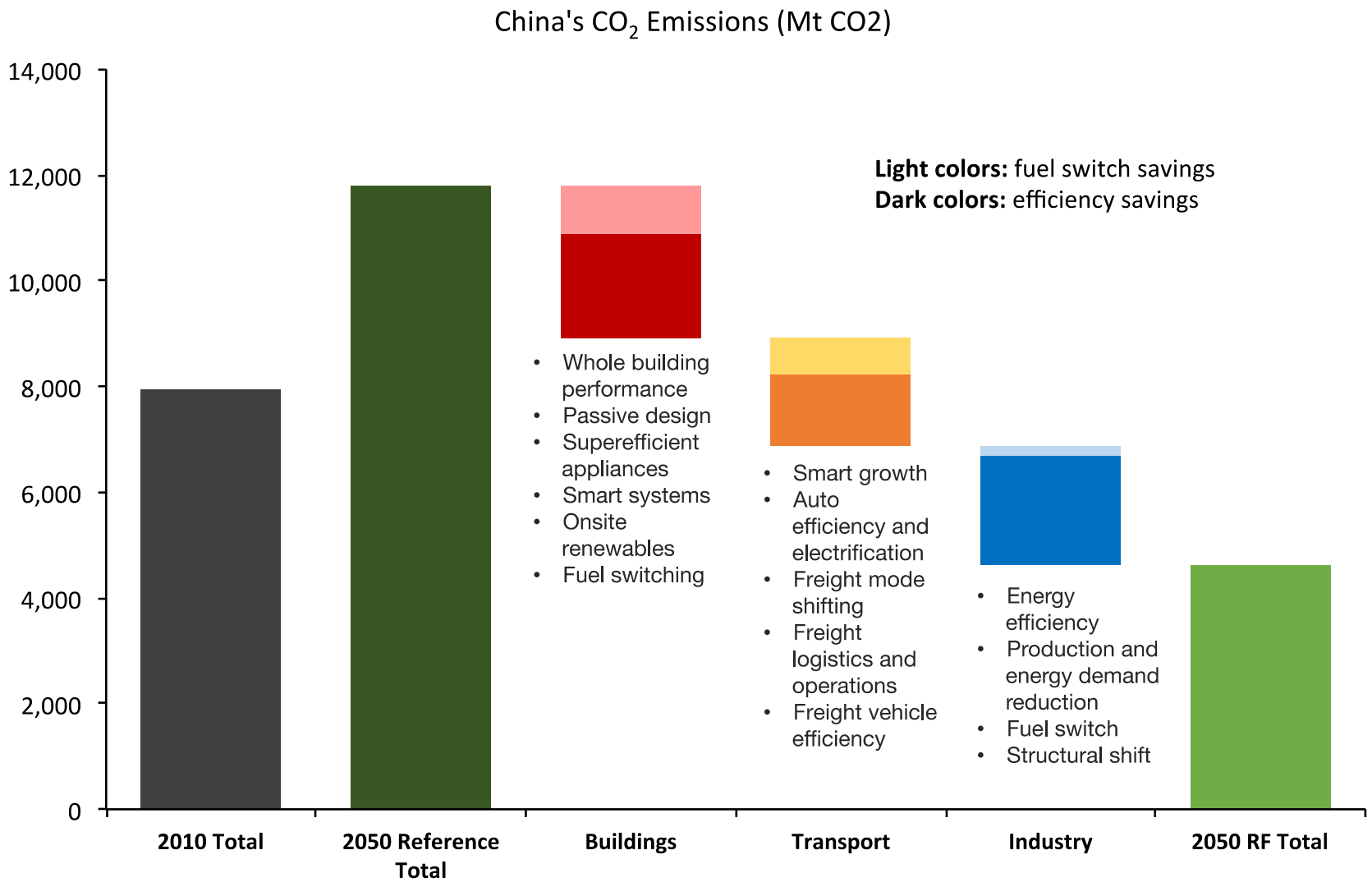
REINVENTING FIRE CHINA STUDY SHOWS CHINA CAN ACHIEVE THREE PEAKS IN COAL USE, CO_2 EMISSIONS, AND PRIMARY ENERGY USE 重塑能源中国研究显示中国可以达到三个达峰，CO_2,煤炭和主要用能。



* Primary electricity converted using the direct equivalent method (consistent with IPCC)

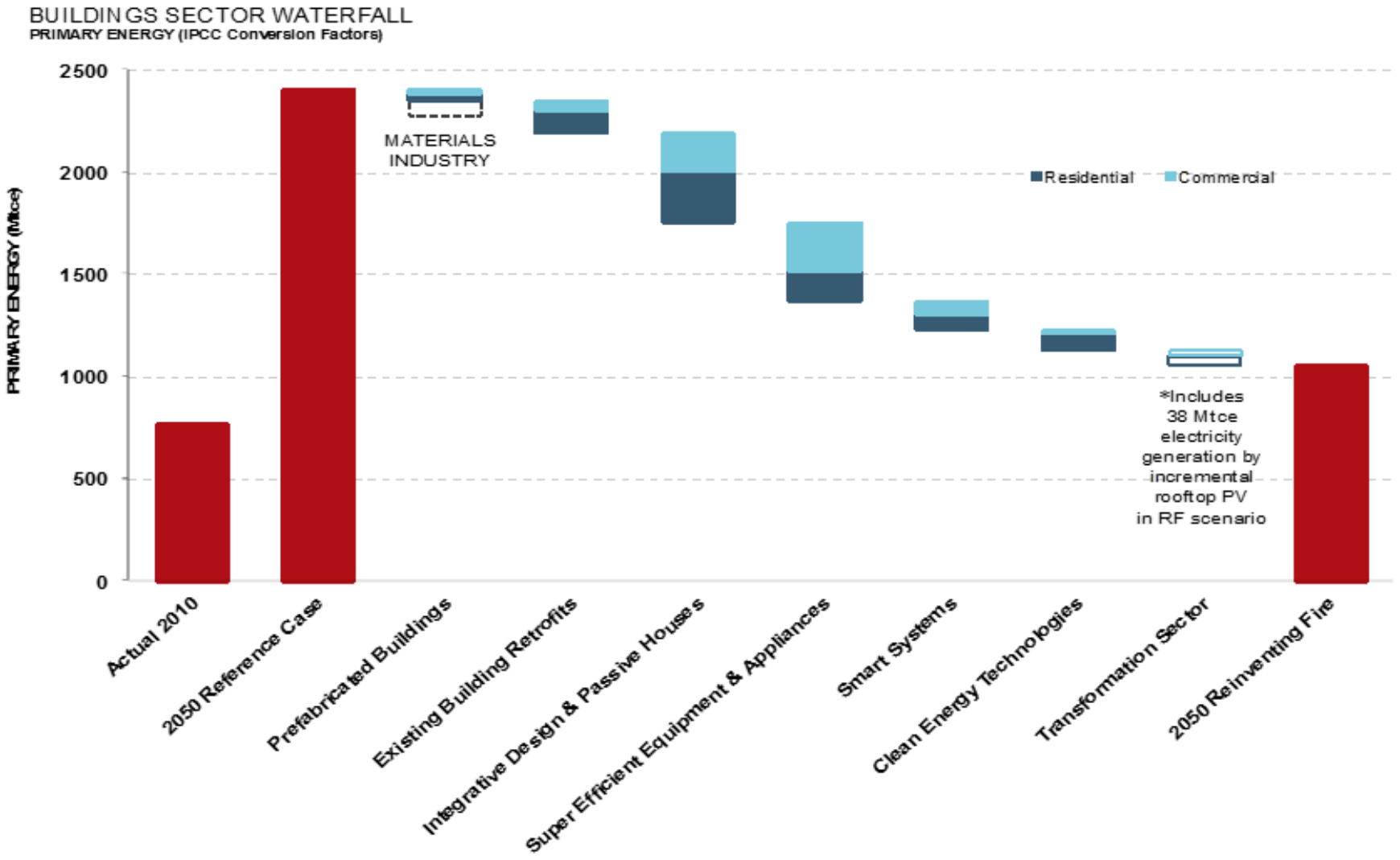
Source: Reinventing Fire: China team analysis, 2015

HUGE ENERGY CO_2 REDUCTION POTENTIAL IN BUILDINGS SECTOR 建筑领域有极大的减排潜力



Source: *RF: China modeling results*

ENERGY REDUCTION POTENTIAL IN COMMERCIAL BUILDINGS 公共建筑领域的减少用能



Source: *RF: China modeling results*

RESEARCH IS SUPPORTED BY NUMEROUS REAL WORLD CASE STUDIES 真实案例支持研究结果

Shenzhen IBR office Building , Shenzhen

Features: integrative design, natural ventilation, high performance envelope, day lighting

Energy: 60% lower energy intensity,

Cost: same cost or lower

Passive House project, Qinhuangdao

Features: passive design, better envelope, air-tightness, dedicated outdoor air system (DOAS)

Energy: 74% less heating. 10 times lower indoor PM2.5

Cost: 10% incremental, recovered by price premium

Integrative Design Retrofit for Empire State Building

Features: chiller, direct digital control, radioactive barrier, energy management, windows, VAV AHU's and Day lighting/plugs

Energy: 277 to 189 kWh/m2

Cost: payback of 3 years.

Prefabricated buildings

Features: Light-weight parting wall. Building lifetime is 10-15 years more, material consumption is 60% less, Building waste is 80%, construction speed 70% less. Reduce PMs at constructions sites.

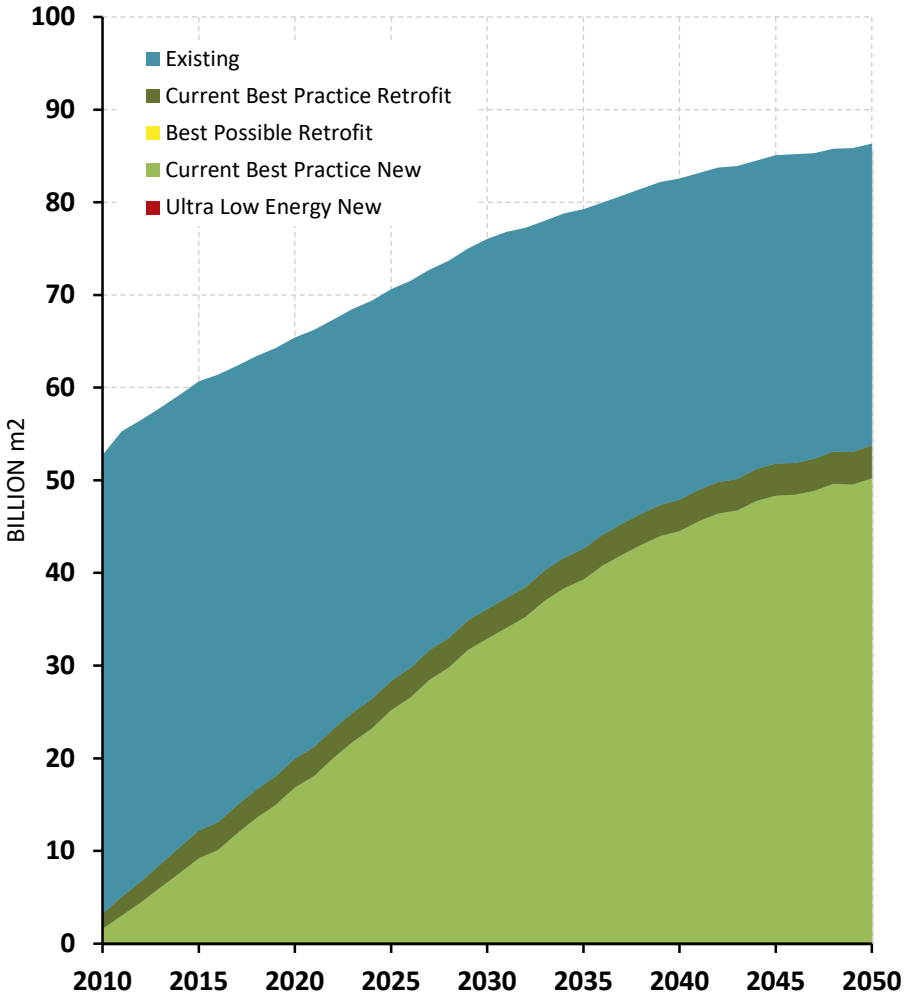
Energy: 5-10% more efficient

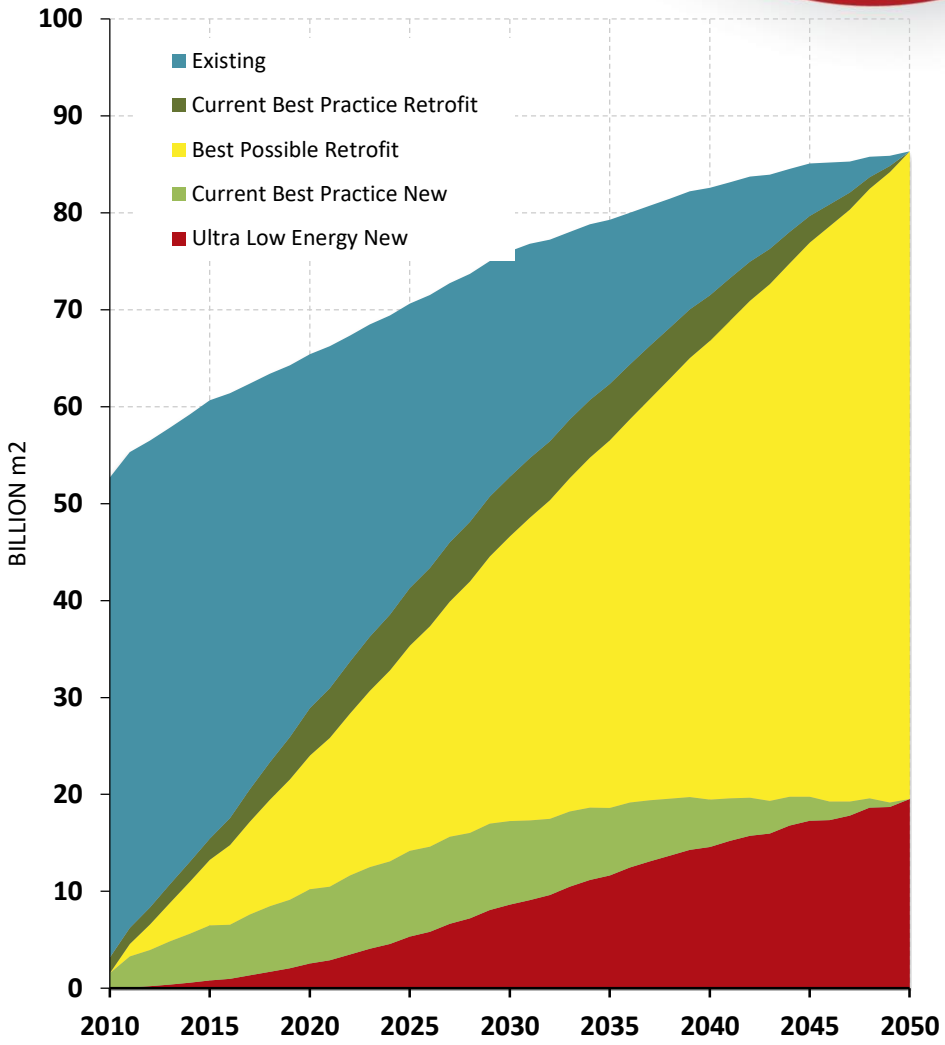
Cost: n/a

Net Zero Energy Buildings

Simulation results shows Net Zero Energy Buildings is possible for high-rise apartment buildings (~20F) by employing both EE measures and RE integration in all climate.

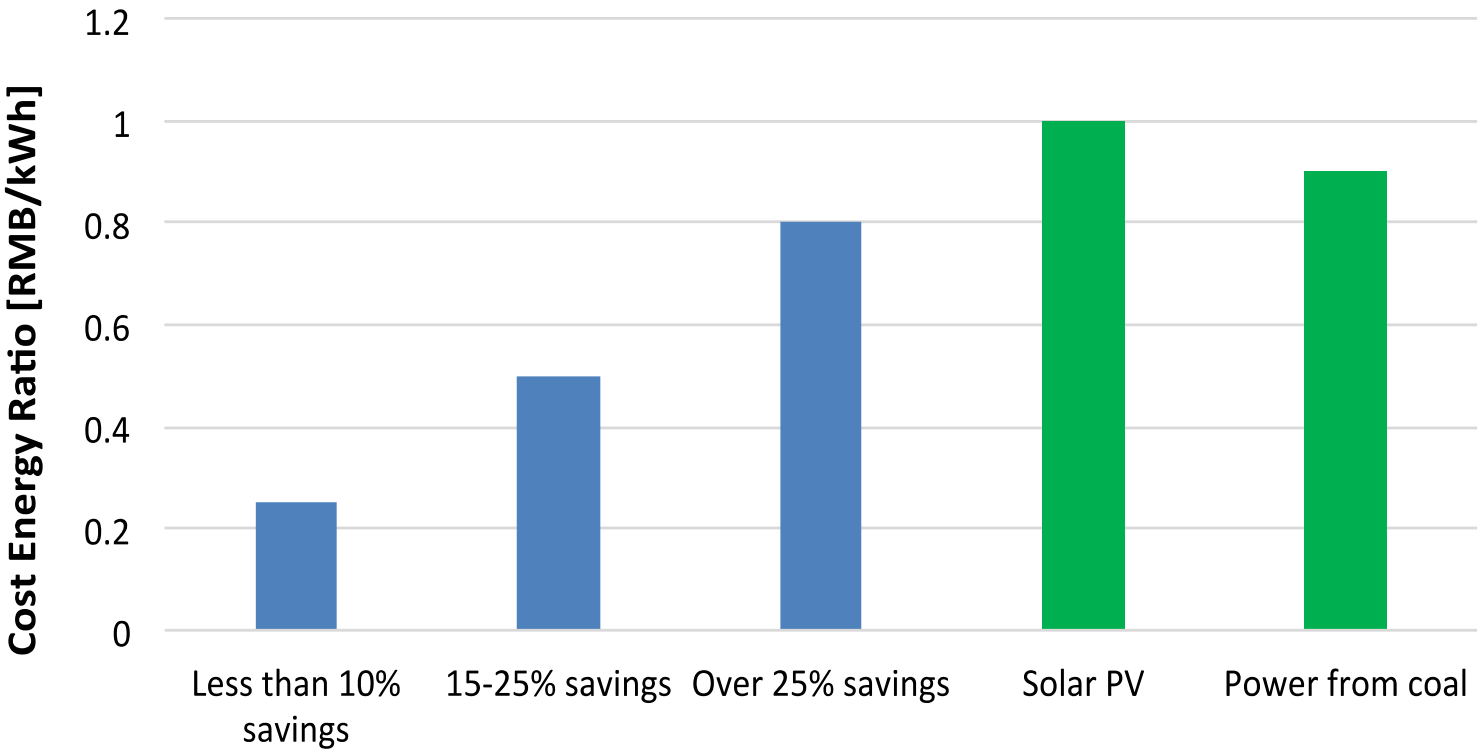
BUILDING STOCK GROWTH BY DIFFERENT PRACTICES 不同建筑种类的增长





RETROFIT BUILDING IS COST EFFECTIVE 建筑节能改造是成本有效的

Figure 3.0 Retrofit Cost Benefit Comparison *

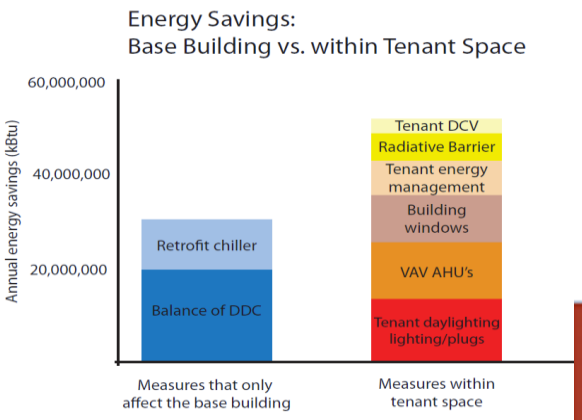


LBNL estimate

BARRIERS TO TECHNICAL LEVERS: EXISTING BUILDING RETROFITS 现有建筑改造的壁垒

Barriers to commercial building energy efficiency: 商业建筑节能阻碍

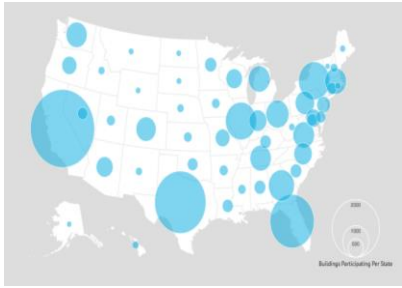
- Unclear ownership of energy efficiency, Split Incentives能源效率所有权不清晰，激励不清楚
- High upfront costs, difficulties in financing 高昂的前期费用，融资难
- Lack of data, transparency, and awareness of energy use status and opportunities 缺乏数据和透明度，以及以及能源利用现状和节能机遇
- Insufficient knowledge in integrative and bundled measures that are cost effective 不了解有成本效益的建筑节能组合措施
- Lack of social transparency and recognition to encourage industry leaders 缺乏社会的透明度去表彰在这方面做得出色的行业领袖
- Inexpensive labor and lack of skills in installation and operation 人工太便宜导致安装和施工缺乏技术



Source: Reinventing Fire team analysis

THE U.S. PRESIDENTIAL BETTER BUILDINGS PROGRAM
美国好建筑项目

- Better Building Challenge 好建筑挑战
  - To make American commercial and public buildings, industrial plants, data centers and multifamily housing at least 20 percent more energy efficient over 10 years.
    为了使美国的商业和公共建筑，工业厂房，数据中心和多户住房，在十年期间达到至少20%的节能。
  - More than 285 leaders, representing over 3.5 billion square feet, 1,000 manufacturing plants, and $5.5 billion in capital committed to financing.
    超过285名的领导，代表超过350十亿平方尺，1000制造工厂的业主，和$ 5.5十亿的资金承诺融资。



- Better Building Alliance 好建筑联合会
  - To demonstrate specific innovative policies and approaches, which will accelerate investment in energy efficiency upon successful demonstration. 证明创新性的政策和策略会加速在能效方面的投资。
- Better Buildings Accelerators 好建筑加速器
  - To address energy efficiency needs in their buildings by setting energy savings goals, developing innovative energy efficiency resources, and adopting advanced cost-effective technologies and market practices.通过设置节能目标，发展创新的能源效率资源，采用先进的具有成本效益的技术和市场惯例解决他们的建筑物的能源效率的需求。
  - More than 200 members, representing over 10 billion commercial square feet across six key market sectors.
    200多名会员，代表超过10十亿商业广场英尺宽六大重点市场领域。

BETTER BUILDING'S PRINCIPLE AND PARTICPANTS
好建筑的项目的原则和参与单位

1. 更好建筑挑战参与单位应遵守： Better Building Challenge Partners should follow

    1. 设立节能目标 Set energy saving goal
    2. 提供用能数据 Provide energy usage data
    3. 分享节能措施 Share energy efficiency retrofit measures

2. 更好建筑挑战参与单位 Participants

    - **自愿参与节能的单位：**

大学

公寓

数据中心

工业

商业

联邦政府

当地政府

合作方：Collaborator

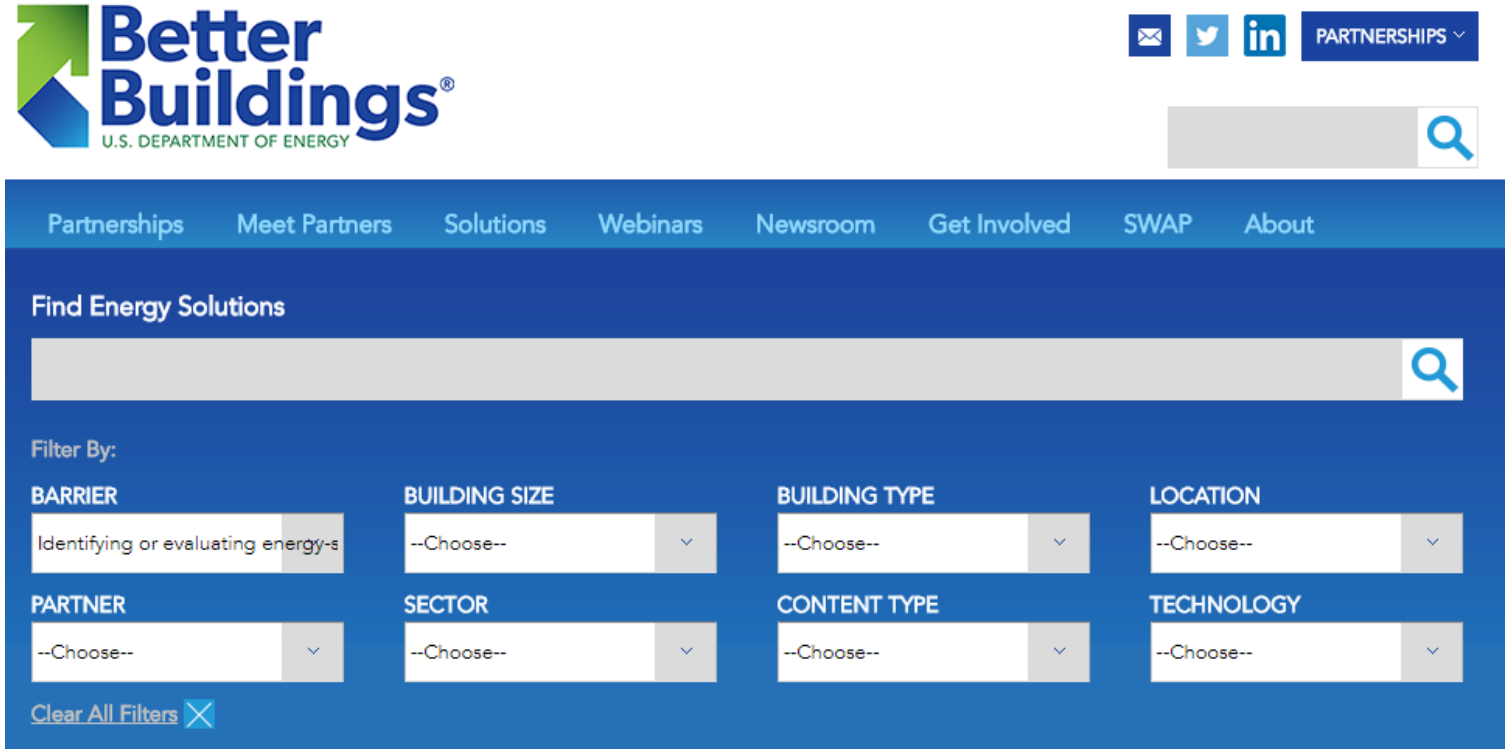
金融机构 Financial Institutions

- 承诺55亿美元给建筑节能改造的贷款 5.5 Billion loan for energy efficiency retrofits

能源公司 Utility companies

- 给业主提供数据 Provide owners with data
- 提供节能项目供业主参加 Provide energy saving programs for building owners to participate

解决方案中心 SOLUTION CENTER



更好建筑加速器:
Better Building Accelerator

对于市场上出现的具体问题或待提高领域，**做成专项课题集中攻克。Focus on one particular areas to accelerate**

◆ 创新技术研发 Research and development

研究领域	牵头单位
照明 Lighting	西北太平洋实验室 PNNL
暖通空调 HVAC	可再生能源国家实验室 NREL
插塞载荷 Plug load	可再生能源国家实验室 NREL
冰箱制冷 Fridge	Navigant Consulting
能源信息与系统 Energy information and systems	劳伦斯伯克利国家实验室 LBNL
可再生能源并网 Renewable energy integration	Navigant
实验室 labs	劳伦斯伯克利国家实验室 LBNL
食品行业 Food industry	Navigant Consulting

- **年度大会 Annual summit**

◆表彰 Recognition

- 经验分享 Share experience
- 连接各方单位(例如让业主和贷款单位连接) Connect stakeholders
- 超过900人参加了2016年的大会 More than 900 people participated in 2016 summit

借鉴于BBC——中国好建筑 China Better Building Program

国家发改委和住建部已同意在中国开展中国好建筑项目

NDRC and MOHURD have approved Better Building Program

已被正式列入中美首脑能效行动方案合作框架下

Officially listed under U.S.-China Energy Efficiency Action Plan

建议先在地方做试点，成功后全国推广

Suggest to start with local pilot and then entire country

建成一批有重新能力的科研中心机构

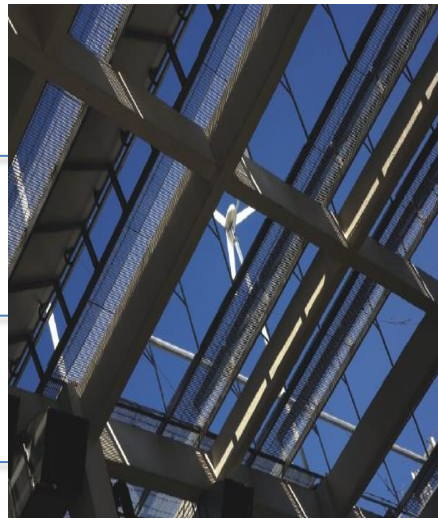
Build capable research institutions

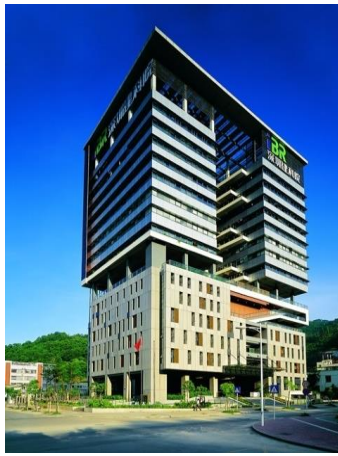
带动新的节能技术和服务产业，新的金融机制

Drive for new technologies and service sector and new financing mechanism

Help to reach country wide and local wide carbon peaking goal

对国家和城市节能和碳排放提前达峰贡献





KEY QUESTIONS FOR DISCUSSION TODAY 主要的讨论问题

- What do you think are key barriers for building energy efficiency for new and retrofit buildings?
  你认为什么是新建建筑和建筑节能改造的的主要障碍？
- Do you see the U.S. Better Building Program can provide a good example for Chinese buildings, eg. Recognition and data and case study sharing? 你认为美国的好建筑项目将会是给中国的一个很好的例子吗？比如说政府表彰和认可，以及数据和案例共享
- What do you see as the barriers for implementation of a China Better Building Program in China? 你认为在中国做好建筑项目可能遇到最大的问题是什么？
- What do you suggest as solutions that are suitable for China? 你给中国推荐什么解决方案呢？

ThankYou! 谢谢！

Lawrence Berkeley National Laboratory

China Energy Group

劳伦斯伯克利国家实验室

中国研究组

1 Cyclotron Road, Berkeley, CA

Tel: +1-510-486-4106

Nan Zhou; Email: Nzhou@lbl.gov